

TABLE 6 - APPROXIMATE UPPER BOUND ON PERCENTAGE OF STATIONS TO WHICH SUPPLEMENTAL VHF OR UHF SPECTRUM CAN BE ASSIGNED IN THE ABSENCE OF ADJACENT CHANNEL RESTRAINTS

MAXIMUM SEPARATION DISTANCE KILOMETERS	VHF	UHF	SIX - MHz TOTAL PERCENT
300	78.2	56.6	65.2
290	81.5	58.8	67.8
280	83.8	62.6	71.0
270	86.3	67.6	75.0
260	88.8	70.5	77.7
250	90.7	73.9	80.5
240	91.8	79.2	84.1
230	94.9	82.8	87.6
220	95.3	88.8	91.3
210	96.3	91.2	93.1
200	97.7	94.7	95.8
190	98.3	95.8	96.6
180	99.2	98.1	98.4
170	99.2	98.7	98.8
160	100.0	99.6	99.7

MAXIMUM SEPARATION DISTANCE KILOMETERS	VHF	UHF	THREE - MHz TOTAL PERCENT
300	90.8	74.9	81.1
290	91.6	79.1	84.0
280	91.8	82.6	86.2
270	94.9	86.2	89.6
260	95.9	89.0	91.7
250	96.9	91.6	93.6
240	98.2	94.2	95.7
230	98.7	96.2	97.1
220	98.9	97.2	97.8
210	98.9	98.0	98.3
200	99.4	99.1	99.3
190	99.9	99.2	99.4
180	100.0	99.9	99.9
170	100.0	100.0	100.0
160	100.0	100.0	100.0

A P P E N D I X C

Preliminary Analysis

Part II

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PRELIMINARY ANALYSIS

OF VHF AND UHF

SPECTRUM SCENARIOS

PART II

(REPACKING)

September 1989

PRELIMINARY ANALYSIS OF VHF & UHF
SPECTRUM SCENARIOS -- PART II
(REPACKING)

Executive Summary

Last summer, the Spectrum Utilization and Alternative Working Party examined a number of spectrum scenarios to find additional VHF and UHF spectrum for use in conjunction with existing channels on either a supplemental or simulcast basis. This document, a follow-up to the earlier work, examines the availability of spectrum for ATV under a tabula rasa-approach plan known as "repacking". Repacking entails the partial or total reshuffling of existing TV channel assignments to obtain a more spectrally efficient (optimal or near-optimal) allotment. The data presented herein was generated by the FCC Office of Engineering & Technology and given to the Working Party for analysis.

The purpose of this exercise is two-fold: the first is to determine whether by rearranging all existing TV assignments enough vacant spectrum could be made available for a separate HDTV allocation. This allocation could be used for simulcasting or as supplemental channels. The second is whether there is sufficient capacity within the VHF and UHF spectrum to accommodate all existing licensees with wider channels, say 9- or 12-MHz-wide.

Repacking encompasses a multitude of different spectrum scenarios. However, because of time constraints only four different scenarios were examined. Specifically, two scenarios investigated the wholesale rearrangement of existing TV assignments using 6-MHz-wide channels for different co-channel and adjacent-channel constraints. The other two investigated the wholesale rearrangement of existing TV assignments using 9-MHz-wide channels for the same constraints. All in all, we believe that the scenarios examined to date are adequate to present a preliminary assessment of this plan.

The document contains a number of findings and observations. These findings are based on the premise that the method used furnishes optimal or near-optimal results. Among the major findings:

- 1) Repacking of the VHF and UHF spectrum using 6-MHz-wide channels shows little, if any, "excess" spectrum is available for a separate HDTV allocation. This finding also suggests that the current NTSC allotment plan is spectrally efficient.

- 2) Repacking of the VHF and UHF spectrum using 9-MHz-wide channels cannot achieve total ATV accommodation for ATV systems that exhibit equal or less robust interference characteristics than the current NTSC system. To achieve total or high ATV accommodation under these scenarios, the ATV system must exhibit more robust interference characteristics than NTSC. This finding is identical to the one reported in the previous study for both the simulcast and augmentation plans. The difference, however, is that under repacking, disruption to existing broadcast operations is significantly greater.
- 3) Given the technical, economic and regulatory complexities of implementing a repacking plan coupled with the findings above, it is suggested that repacking is probably not worthy of consideration as a viable alternative within the existing broadcast allocations.

PRELIMINARY ANALYSIS OF VHF AND UHF
SPECTRUM SCENARIOS -- PART II
(REPACKING)

I. Introduction

Working Party 3, the Spectrum Utilization and Alternatives Working Party, was tasked with examining a constellation of spectrum scenarios for implementing an advanced television service within the existing VHF and UHF television allocations. Last summer, WP-3 examined a number of spectrum scenarios to find additional spectrum for use in conjunction with existing channels on either a supplemental or simulcast basis. This document is a follow-up to the previous work. Specifically, the document examines the availability of spectrum under a different plan -- commonly referred to as "repacking". The repacking plan encompasses a set of spectrum scenarios similar to those developed in the earlier study (Doc. WP3-0057).

Repacking entails the partial or total rearrangement of existing TV channel assignments to obtain a more spectrally efficient (optimal or near-optimal) allotment. Generally speaking, all repacking scenarios require major disruption to existing broadcast operations, thus are deemed not practical by broadcasters. Nonetheless, this effort was undertaken so that the Advisory Committee and the FCC may evaluate spectrum availability under an entire gamut of assumptions. This effort also was undertaken to test performance of the allotment model under a different set of criteria. This step was necessary in order to refine our methodology prior to investigating more complex scenarios.

The purpose of this study is to determine the following:

- a) Whether by reshuffling the existing TV assignments we could free up enough spectrum to establish a separate HDTV allocation for simulcasting or for use as supplemental channels. This information is also useful in assessing the spectral efficiency of the current NTSC allotment plan. By comparing the current allotment plan with the "best" 6 MHz repacking allotment achieved through repacking, one can determine how good is the current allotment plan.
- b) Whether through repacking, there is sufficient capacity within the existing VHF and UHF broadcast bands to accommodate all existing TV assignments with 9- or 12-MHz-wide channels. This information is useful in helping spectrum managers and systems designers better understand the limitations of the existing spectrum with regard to accommodating wide-channel ATV systems.

Four separate scenarios were examined. Two scenarios focused on the wholesale rearrangement of existing TV assignments using 6-MHz-wide channels for both co-channel and adjacent-channel constraints, or co-channel alone. The other two focused on the wholesale rearrangement of existing TV assignments using 9-MHz-wide channels for the same criteria mentioned above. Examination of 12-MHz-wide channel scenarios was deferred until the results of the 9-MHz-wide channel scenarios were fully analyzed.

While the four scenarios examined herein are only but a small sample of all possible scenarios for repacking, it is believed that the results presented herein are significant and warrant some discussion prior to proceeding further with the examination of other repacking scenarios.

II. Analysis

Prior to presenting the analysis, a few comments and observations are in order. First, it is important to recognize that the work completed to date is preliminary and should be treated as such, even though all the scenarios were investigated using the most recent FCC broadcast database, including pending applications, and provisions were made to protect Canadian and Mexican assignments. Second, it is important to emphasize that all the findings presented in this document assume that the method used furnishes optimal or near-optimal results. While there is no easy way to test this assumption, based on the experience gained to date it is believed that this assumption is not unreasonable. Third, it is also important to recognize that the degree of protection allowed for Canadian and Mexican TV assignments under this plan has a significant impact on the ATV accommodation statistics and/or the availability of assignable spectrum for ATV. This observation is somewhat different from what was observed under a simulcast or augmentation plan. Under these plans, the degree of protection allowed for Canadian and Mexican assignments had only a small impact on the overall ATV statistics. It is believed, however, that the protection used for this analysis is somewhat conservative which, in turn, tends to make the ATV statistics somewhat lower -- especially at separation distances which exceed NTSC. Nevertheless, this point needs further investigation.

Description of Methodology

Given the absence of actual interference susceptibility data, the method used for the previous study was again used to assess the various repacking options. Specifically, the method uses minimum separation distances to determine the number of existing TV

assignments that can be accommodated under the different scenarios. Studies considered both co-channel and adjacent-channel minimum separations, or co-channel alone. The analysis did not attempt to physically relocate existing transmitters to improve the accommodation statistics.

a) 6 MHz Repacking Scenarios

Basically, the 6 MHz repacking scenarios were investigated for the following reasons:

- 1) To establish a baseline to use for comparing the spectral efficiency of all other repacking scenarios, including the current allotment plan.
- 2) To determine whether by using the "optimal" allotment plan, enough spectrum could be made available to give each licensee an additional 3 or 6 MHz of spectrum at separation distances equivalent to or greater than NTSC. This information is useful for the case where ATV system designers are unable to develop ATV systems that exhibit more robust interference characteristics than NTSC.
- 3) To compare the performance of 6 MHz repacking scenarios to 6 MHz augmentation or simulcast scenarios.

The 6 MHz repacking analysis focused on the wholesale rearrangement of existing TV assignments rather than a few assignments or a portion of the UHF or VHF spectrum. Repacking using 6-MHz-wide channels essentially uses all 67 channels currently available for NTSC to develop new "optimal" allotment plans for different co-channel and adjacent-channel constraints. Specifically, one scenario used only co-channel constraints while the other used both co-channel and adjacent-channel constraints. The adjacent-channel constraint was fixed at 80 km.

Theoretically, there are two possible approaches for implementing a 6 MHz repacking plan. The first is a transitionally incompatible approach where existing licensees abandon their existing operations and directly upgrade to ATV. The second is a transitionally compatible approach where existing licensees are allowed to operate both their existing facilities and the new ATV facilities under a simulcast or augmentation arrangement. While the first approach essentially needs half the amount of spectrum as the second one, the disruption to the existing broadcast services would be so severe that the FCC rejected this approach in its recent Further Notice on ATV.

To determine the degree of ATV accommodation under a transitionally compatible approach, one has to first repack all existing assignments at minimum NTSC separation distances, then proceed with assigning ATV channels from any vacant spectrum left over as the result of repacking. To illustrate how such an approach would work, assume that it is possible to repack all the existing TV assignments in half the available channels or better, i.e., 33 channels instead of the current 67. Then, the remaining channels could be used to achieve a 100% accommodation for ATV at separation distances equivalent to NTSC. If, on the other hand, repacking of the existing assignments requires 2/3 (45) of the available channels, then only 1/3 (22) of the channels would be available for ATV. These channels would not be sufficient to achieve a 100% ATV accommodation at separation distances equivalent to NTSC, but maybe at shorter separation distances.

b) 9 MHz Repacking Scenarios

The 9 MHz repacking analysis also focused on the wholesale rearrangement of all of the existing TV assignments. No partial repacking was investigated. Repacking using 9-MHz-wide channels essentially reduces the number of assignable channels from 12 to 7 at VHF and from 55 to 35 at UHF, for a total of 43 channels. This means that existing assignments must be squeezed into 43 channels instead of the 67 channels available for the 6 MHz repacking scenarios. Also, 9 MHz repacking scenarios can only be implemented using a transitionally incompatible approach.

As to the reasons for examining 9-MHz-wide repacking scenarios, they are:

- 1) To determine whether total ATV accommodation is possible for ATV systems (both compatible or incompatible) that require contiguous spectrum. This information is useful in better understanding the limitations of the VHF and UHF spectrum with regard to accommodating wide-channel ATV systems.
- 2) To compare the performance of 9 MHz repacking scenarios to the 9-MHz-wide augmentation scenarios.

III. Results

a) 6 MHz Repacking

Tables 1 and 2 present the number of channels used to repack the existing TV assignments for different separation distances. They also present the number of channels available for ATV for the same separation distances. Also, the percentages of existing TV

assignments accommodated under repacking are presented in parentheses. Note that these percentages are not ATV accommodation statistics. Table 1 assumes an 80-kilometer adjacent-channel protection, while Table 2 assumes no adjacent-channel protection.

Table 1
6 MHz Repacking With Adjacent-Channel Protection

Minimum Separation Distance in km	Number of Ch. Used	Number of Ch. Available for ATV
320	-	-
300	67 (98.0%)	0
280	67 (98.5%)	0
260 (NTSC)	67 (99.6%)	0
240	67 (100%)	0
220	64 (100%)	3
200	48 (100%)	19
180	44 (100%)	23
160	41 (100%)	26

Table 2
6 MHz Repacking Without Adjacent-Channel Protection

Minimum Separation Distance in km	Number of Ch. Used	Number of Ch. Available for ATV
320	67 (98.4%)	0
300	67 (99.5%)	0
280	65 (100%)	2
260 (NTSC)	60 (100%)	7
240	53 (100%)	14
220	48 (100%)	19
200	43 (100%)	24
180	39 (100%)	28
160	35 (100%)	32

A review of the data in Tables 1 and 2 reveals that at 260 km (minimum spacing for NTSC service) little, if any, additional spectrum is available. Specifically, no vacant channels are available for ATV for the adjacent-channel protection case, and only seven channels are available for the co-channel-only case. At distances less than minimum spacing, the availability of channels increases as a function of decreasing distance.

And, even at 160 km, at least 41 channels or 246 MHz of spectrum are required to operate a simulcast service for the adjacent-channel protection case and 35 channels or 210 MHz are required for the co-channel-only case. This finding suggests that even a wholesale rearrangement of existing stations offers little, if any, additional spectrum for a separate ATV service. It also suggests that the current NTSC assignment plan is spectrally efficient.

Comparison of the statistics between Tables 1 and 2 indicates that by eliminating the adjacent-channel protection some improvement in the statistics is achieved -- approximately a saving of five or six channels for the same separation distance.

b) 9 MHz Repacking

Tables 3 and 4 present the number of channels used to repack the existing TV assignments for different separation distances. They also present the number of channels available for the same separation distances. Also, the percentages of existing TV assignments accommodated under repacking are presented in parentheses. Unlike the 6 MHz repacking scenarios, the percentages here represent ATV accommodation statistics. Note, however, that these percentages assume a transitionally incompatible implementation approach. Here again, Table 3 assumes an 80-kilometer adjacent-channel protection, while Table 4 assumes no adjacent-channel protection.

Table 3
9 MHz Repacking With Adjacent-Channel Protection

Minimum Separation Distance in km	Number of Ch. Used	Number of Ch. Available
320	-	-
300	-	-
280	-	-
260	43 (90.9%)	0
240	43 (93.2%)	0
220	43 (96.7%)	0
200	43 (97.6%)	0
180	43 (98.6%)	0
160	43 (99.5%)	0

Table 4
9 MHz Repacking Without Adjacent-Channel Protection

Minimum Separation Distance in km	Number of Ch. Used	Number of Ch. Available
320	43 (85.5%)	0
300	43 (89.2%)	0
280	43 (90.5%)	0
260	43 (94.8%)	0
240	43 (97.4%)	0
220	43 (98.8%)	0
200	43 (99.8%)	0
180	41 (100%)	2
160	35 (100%)	9

A review of the data in Tables 3 and 4 reveals that at 260 km (minimum spacing for NTSC service) total accommodation is not possible. At distances less than minimum spacing, the availability increases as a function of decreasing distance. This finding suggests that in order to achieve total accommodation under these scenarios, the ATV system must exhibit more robust interference characteristics than the current NTSC service -- a similar finding as in the cases of the augmentation and simulcast plans. However, the difference is that under these repacking scenarios disruption to existing operation is significantly greater.

A comparison of the 9-MHz-wide augmentation scenarios to the 9 MHz repacking scenarios will be examined in a future report.

A P P E N D I X D

Tables

Preliminary Analysis

Part III

TABLE 1-D
ATV/NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS VHF	SATISFIED UHF	TOTAL	# OF ATV LOST*
<u>Inter/Cross Modulation</u>					
n + 2	8.0	700	1050	1750	2
n + 2	16.1	703	1047	1750	2
n + 2	24.1	700	1050	1750	2
n + 2	32.2	699	1050	1749	3
n + 2	40.2	695	1049	1744	8
n + 2	48.3	699	1041	1740	12
n + 2	56.3	700	1031	1731	21
n + 2	64.4	697	1022	1719	33
n - 2	8.0	700	1050	1750	2
n - 2	16.1	703	1047	1750	2
n - 2	24.1	700	1050	1750	2
n - 2	32.2	699	1050	1749	3
n - 2	40.2	695	1049	1744	8
n - 2	48.3	699	1041	1740	12
n - 2	56.3	700	1031	1731	21
n - 2	64.4	697	1022	1719	33
n + 3	8.0	700	1049	1749	3
n + 3	16.1	700	1049	1749	3
n + 3	24.1	698	1050	1748	4
n + 3	32.2	702	1045	1747	5
n + 3	40.2	697	1044	1741	11
n + 3	48.3	697	1041	1738	14
n + 3	56.3	695	1034	1729	23
n + 3	64.4	689	1029	1718	34

*Bold type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.

TABLE 1-D
ATV/NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS VHF	SATISFIED UHF	TOTAL	# OF ATV LOST*
<u>Inter/Cross Modulation</u>					
n - 3	8.0	700	1049	1749	3
n - 3	16.1	700	1049	1749	3
n - 3	24.1	698	1050	1748	4
n - 3	32.2	702	1045	1747	5
n - 3	40.2	697	1044	1741	11
n - 3	48.3	697	1041	1738	14
n - 3	56.3	695	1034	1729	23
n - 3	64.4	689	1029	1718	34
 n + 4	 8.0	 703	 1046	 1749	 3
n + 4	16.1	703	1046	1749	3
n + 4	24.1	700	1049	1749	3
n + 4	32.2	702	1046	1748	4
n + 4	40.2	698	1045	1743	9
n + 4	48.3	699	1041	1740	12
n + 4	56.3	697	1039	1736	16
n + 4	64.4	695	1035	1730	21
 n - 4	 8.0	 703	 1046	 1749	 3
n - 4	16.1	703	1046	1749	3
n - 4	24.1	700	1049	1749	3
n - 4	32.2	702	1046	1748	4
n - 4	40.2	698	1045	1743	9
n - 4	48.3	699	1041	1740	12
n - 4	56.3	697	1039	1736	16
n - 4	64.4	695	1035	1730	22

Bold type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.

TABLE 1-D
ATV/NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS SATISFIED			# OF ATV LOST*
		VHF	UHF	TOTAL	
<u>Inter/Cross Modulation</u>					
n + 5	8.0	704	1046	1750	2
n + 5	16.1	702	1048	1750	2
n + 5	24.1	704	1046	1750	2
n + 5	32.2	696	1052	1748	4
n + 5	40.2	692	1048	1740	12
n + 5	48.3	695	1043	1738	14
n + 5	56.3	686	1034	1720	32
n + 5	64.4	684	1024	1708	44
n - 5	8.0	704	1046	1750	2
n - 5	16.1	702	1048	1750	2
n - 5	24.1	704	1046	1750	2
n - 5	32.2	696	1052	1748	4
n - 5	40.2	692	1048	1740	12
n - 5	48.3	695	1043	1738	14
n - 5	56.3	686	1034	1720	32
n - 5	64.4	684	1024	1708	44
n+2, n+4	8.0	701	1036	1737	15
n+2, n+4	16.1	693	1043	1736	16
n+2, n+4	24.1	698	1037	1735	17
n+2, n+4	32.2	690	1043	1733	19
n+2, n+4	40.2	694	1033	1727	25
2, n+4	48.3	689	1024	1713	39
n+2, n+4	56.3	690	1021	1711	41
n+2, n+4	64.0	679	1011	1690	62

*Bold type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.

TABLE 1-D
ATV/NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS VHF	SATISFIED UHF	TOTAL	# OF ATV LOST*
<u>Inter/Cross Modulation</u>					
n-2, n-4	8.0	701	1036	1737	15
n-2, n-4	16.1	693	1043	1736	16
n-2, n-4	24.1	698	1037	1735	17
n-2, n-4	32.2	690	1043	1733	19
n-2, n-4	40.2	694	1033	1727	25
n-2, n-4	48.3	689	1024	1713	39
n-2, n-4	56.3	690	1021	1711	41
n-2, n-4	64.4	679	1011	1690	62
n+2,3,4,5	31.4	673	1009	1682	70
<u>IF-Related</u>					
n + 7	8.0	704	1047	1751	1
n + 7	16.1	699	1052	1751	1
n + 7	24.1	704	1047	1751	1
n + 7	32.2	702	1048	1750	2
n + 7	40.2	699	1040	1739	13
n + 7	48.3	694	1038	1732	20
n + 7	56.3	690	1025	1715	37
n + 7	64.4	695	1006	1701	51
n - 7	8.0	704	1047	1751	1
n - 7	16.1	699	1052	1751	1
n - 7	24.1	704	1047	1751	1
n - 7	32.2	702	1048	1750	2
n - 7	40.2	699	1040	1739	13
n - 7	48.3	694	1038	1732	20
n - 7	56.3	690	1025	1715	32
n - 7	64.4	695	1006	1701	51

bold type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.

TABLE 1-D
ATV/NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS VHF	SATISFIED UHF	TOTAL	# OF ATV LOST*
<u>IF-Related</u>					
n + 8	8.0	703	1048	1751	1
n + 8	16.1	703	1048	1751	1
n + 8	24.1	701	1050	1751	1
n + 8	32.2	703	1047	1750	2
n + 8	40.2	698	1050	1748	4
n + 8	48.3	703	1043	1746	6
n + 8	56.3	702	1038	1740	12
n + 8	64.4	691	1041	1732	20
n - 8	8.0	703	1048	1751	1
n - 8	16.1	703	1048	1751	1
n - 8	24.1	701	1050	1751	1
n - 8	32.2	703	1047	1750	2
n - 8	40.2	698	1050	1748	4
n - 8	48.3	703	1043	1746	6
n - 8	56.3	702	1038	1740	12
n - 8	64.4	691	1041	1732	20
<u>Image</u>					
n + 14	64.4	695	1037	1732	20
n + 14	80.5	691	1036	1727	25
n + 14	96.5	689	1028	1717	35
n + 15	64.4	686	1033	1719	33
n + 15	80.5	690	1020	1710	42
n + 15	96.5	678	1020	1698	54
n + 15	112.6	677	992	1669	83
n + 15	119.9	675	978	1653	99
n + 15	128.7	673	968	1641	112

Bold type denotes approximate minimum distances set by FCC for NTSC.

***ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.**

TABLE 2-D
NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS SATISFIED			# OF ATV LOST*
		VHF	UHF	TOTAL	
<u>Inter/Cross Modulation</u>					
n + 2	8.0	699	1053	1752	0
n + 2	16.1	699	1053	1752	0
n + 2	24.1	698	1054	1752	0
n + 2	32.2	704	1048	1752	0
n + 2	40.2	703	1048	1751	1
n + 2	48.3	701	1050	1751	1
n + 2	56.3	703	1048	1751	1
n + 2	64.4	703	1048	1751	1
n - 2	8.0	701	1050	1751	1
n - 2	16.1	701	1050	1751	1
n - 2	24.1	701	1051	1751	1
n - 2	32.2	701	1050	1751	1
n - 2	40.2	704	1047	1751	1
n - 2	48.3	703	1048	1751	1
n - 2	56.3	702	1048	1750	2
n - 2	64.4	701	1047	1748	4
n + 3	8.0	701	1050	1751	1
n + 3	16.1	701	1050	1751	1
n + 3	24.1	701	1050	1751	1
n + 3	32.2	703	1047	1750	2
n + 3	40.2	702	1048	1750	2
n + 3	48.3	702	1047	1749	2
n + 3	56.3	702	1046	1748	4
n + 3	64.4	700	1046	1746	6

Bold type denotes approximate minimum distances set by FCC for NTSC.

***ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.**

TABLE 2-D
NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS SATISFIED			# OF ATV LOST*
		VHF	UHF	TOTAL	
<u>Inter/Cross Modulation</u>					
n - 3	8.0	701	1049	1750	2
n - 3	16.1	702	1048	1750	2
n - 3	24.1	702	1048	1750	2
n - 3	32.2	701	1048	1749	3
n - 3	40.2	700	1049	1749	3
n - 3	48.3	700	1049	1749	3
n - 3	56.3	702	1047	1749	3
n - 3	64.4	704	1042	1746	6
n + 4	8.0	704	1048	1752	0
n + 4	16.1	703	1049	1752	0
n + 4	24.1	702	1050	1752	0
n + 4	32.2	704	1048	1752	0
n + 4	40.2	701	1050	1751	0
n + 4	48.3	703	1047	1750	1
n + 4	56.3	703	1047	1750	2
n + 4	64.4	704	1046	1750	1
n - 4	8.0	701	1050	1751	1
n - 4	16.1	701	1050	1751	1
n - 4	24.1	703	1048	1751	1
n - 4	32.2	703	1048	1751	1
n - 4	40.2	703	1048	1751	1
n - 4	48.3	703	1047	1750	0
n - 4	56.3	703	1047	1750	0
n - 4	64.4	701	1049	1748	0

bold type denotes approximate minimum distances set by FCC for NTSC.

***ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.**

TABLE 2-D
NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS VHF	SATISFIED UHF	TOTAL	# OF ATV LOST*
<u>Inter/Cross Modulation</u>					
n + 5	8.0	704	1048	1752	0
n + 5	16.1	704	1048	1752	0
n + 5	24.1	705	1047	1752	0
n + 5	32.2	703	1049	1752	0
n + 5	40.2	704	1048	1752	0
n + 5	48.3	705	1047	1752	0
n + 5	56.3	705	1047	1752	0
n + 5	64.4	704	1048	1752	0
n - 5	8.0	703	1049	1752	0
n - 5	16.1	701	1051	1752	0
n - 5	24.1	702	1050	1752	0
n - 5	32.2	702	1050	1752	0
n - 5	40.2	703	1049	1752	0
n - 5	48.3	703	1049	1752	0
n - 5	56.3	702	1050	1752	0
n - 5	64.4	702	1048	1750	2
n+2, n+4	8.0	700	1051	1751	1
n+2, n+4	16.1	699	1052	1751	1
n+2, n+4	24.1	698	1053	1751	1
n+2, n+4	32.2	701	1050	1751	1
n+2, n+4	40.2	700	1050	1750	2
n+2, n+4	48.3	699	1050	1749	3
n+2, n+4	56.3	703	1042	1745	7
n+2, n+4	64.4	698	1047	1745	7

bold type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.

TABLE 2-D**NTSC SCENARIO+**

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS VHF	SATISFIED UHF	TOTAL	# OF ATV LOST*
n-2, n-4	8.0	702	1048	1750	2
n-2, n-4	16.1	703	1047	1750	2
n-2, n-4	24.1	703	1047	1750	2
n-2, n-4	32.2	703	1047	1750	2
n-2, n-4	40.2	703	1047	1750	2
n-2, n-4	48.3	704	1042	1746	6
n-2, n-4	56.3	704	1041	1745	7
n-2, n-4	64.4	699	1044	1743	9
n±2,3,4,5	32.2	679	1023	1702	50
<u>IF-Related</u>					
n + 7	8.0	702	1050	1752	0
n + 7	16.1	701	1051	1752	0
n + 7	24.2	705	1047	1752	0
n + 7	32.2	704	1048	1752	0
n + 7	40.2	704	1048	1752	0
n + 7	48.3	704	1048	1752	0
n + 7	56.3	702	1048	1750	2
n + 7	64.4	700	1046	1746	6
n - 7	8.0	703	1049	1752	0
n - 7	16.1	703	1049	1752	0
n - 7	24.1	703	1049	1752	0
n - 7	32.2	704	1048	1752	0
n - 7	40.2	703	1049	1752	0
n - 7	48.3	702	1050	1752	0
n - 7	56.3	702	1050	1752	0
n - 7	64.4	701	1048	1749	3

bold type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.

TABLE 2-D
NTSC SCENARIO+

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS SATISFIED			# OF ATV LOST*
		VHF	UHF	TOTAL	
<u>IF-Related</u>					
n + 8	8.0	704	1048	1752	0
n + 8	16.1	704	1048	1752	0
n + 8	24.1	704	1048	1752	0
n + 8	32.2	704	1048	1752	0
n + 8	40.2	703	1049	1752	0
n + 8	48.3	704	1048	1752	0
n + 8	56.3	703	1049	1752	0
n + 8	64.4	703	1049	1752	0
n - 8	8.0	705	1047	1752	0
n - 8	16.1	701	1051	1752	0
n - 8	24.1	703	1049	1752	0
n - 8	32.2	703	1049	1752	0
n - 8	40.2	703	1049	1752	0
n - 8	48.3	704	1048	1752	0
n - 8	56.3	701	1051	1752	0
n - 8	64.4	703	1049	1752	0
<u>Image</u>					
n + 14	64.4	701	1050	1751	1
n + 14	80.5	702	1047	1749	3
n + 14	96.5	701	1046	1747	5
n + 15	64.4	701	1048	1749	3
n + 15	80.5	703	1045	1748	4
n + 15	96.5	696	1046	1742	10
+ 15	112.6	692	1037	1729	23
n + 15	119.9	692	1030	1722	30
n + 15	128.7	693	1026	1719	33

bold type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.

TABLE 3-D**NTSC/CO-LOCATION SCENARIO+**

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS SATISFIED			# OF ATV LOST*
		VHF	UHF	TOTAL	
<u>Inter/Cross Modulation</u>					
n + 2	8.0	705	1047	1752	0
n + 2	16.1	705	1047	1752	0
n + 2	24.1	705	1047	1752	0
n + 2	32.2	704	1048	1752	0
n + 2	40.2	703	1048	1751	1
n + 2	48.3	702	1049	1751	1
n + 2	56.3	704	1047	1751	1
n + 2	64.4	705	1046	1751	1
n - 2	8.0	702	1050	1752	0
n - 2	16.1	705	1047	1752	0
n - 2	24.1	703	1049	1752	0
n - 2	32.2	703	1049	1052	0
n - 2	40.3	701	1051	1052	0
n - 2	48.3	701	1051	1752	0
n - 2	56.3	703	1048	1751	1
n - 2	64.4	702	1048	1750	2
n + 3	8.0	700	1052	1752	0
n + 3	16.1	701	1051	1752	0
n + 3	24.1	699	1053	1752	0
n + 3	32.2	701	1051	1752	0
n + 3	40.2	704	1048	1752	0
n + 3	48.3	703	1048	1751	1
n + 3	56.3	704	1047	1751	1
n + 3	64.4	703	1048	1751	1

+Bold type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.

TABLE 3-D**NTSC/CO-LOCATION SCENARIO+**

TABOO CHANNEL	SEPARATION DISTANCE (KM)	NTSC STATIONS SATISFIED			# OF ATV LOST*
		VHF	UHF	TOTAL	
<u>Inter/Cross Modulation</u>					
n - 3	8.0	704	1048	1752	0
n - 3	16.1	705	1047	1752	0
n - 3	24.1	705	1047	1752	0
n - 3	32.2	703	1049	1752	0
n - 3	40.2	705	1047	1752	0
n - 3	48.3	702	1050	1752	0
n - 3	56.3	705	1047	1752	0
n - 3	64.4	700	1051	1751	0
n + 4	8.0	702	1050	1752	0
n + 4	16.1	702	1050	1752	0
n + 4	24.1	703	1049	1752	0
n + 4	32.2	703	1049	1752	0
n + 4	40.2	702	1049	1751	1
n + 4	48.3	701	1050	1751	1
n + 4	56.3	701	1050	1751	1
n + 4	64.4	701	1050	1751	1
n - 4	8.0	702	1050	1752	0
n - 4	16.1	702	1050	1752	0
n - 4	24.1	702	1050	1752	0
n - 4	32.2	702	1050	1752	0
n - 4	40.2	703	1049	1752	0
n - 4	48.3	700	1052	1752	0
n - 4	56.3	703	1049	1752	0
n - 4	64.4	700	1051	1751	1

old type denotes approximate minimum distances set by FCC for NTSC.

*ATV assignments lost relative to minimum co-channel assignments of 160 km and with no other constraints.